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Abstract

The present invention relates to the area scan vision inspection system canning be programmed, in which the CCD camera, the telescope for being adhered to the CCD camera and enlarging the image of an object and observing, the zoom lens for being combined in a telescope and controlling the field of view of the CCD camera, and the scan head are included as to the area scan check system of the semiconductor device transferring of the test equipment and includes the handler supplying the object, the optical source section providing the light source for illuminating an object, and the photography mechanism consisting of the camera for taking a picture of an object. The optical source section includes the light source generator in which a wavelength is generated the different light source with a plurality of. The light source selection switch box for selecting the light having the wave length which is most suitable for the object according to a shape and size of an object and outputting is included. The handler supplying the object is the blood test objects. The CCD camera the photography mechanism is the camera for taking a picture of an object. The scan head moves a phase in order to capture the image of an object while being combined in the zoom lens and fitting the field of view with a shape and size of an object and moving according to the field of view of the CCD camera.

Representative Drawing(s)

Fig. 3

Keyword(s)

The semiconductor device inspection system, area scan, scan head, zoom lens, light source, actuator.

Description

Brief Explanation of the Drawing(s)

Figure 1 is an illustrative view for illustrating the test coverage by the general area scan vision system

The drawing which (a) of fig. 2 shows the shape of the object group consisting of a plurality of objects, and (b) illustrates the test sequence of each object.

Figure 3 is a block diagram showing the omni configuration of the area scan vision inspection system canning be programmed

Figure 4 is a conceptual diagram of the area scan vision inspection system in which the high speed scanning is possible

(b) is the magnificated drawing the object group at (a) of fig. 5 (a) of fig. 5 is the illustrative view illustrating the test coverage by the area scan vision system.

The description of reference numerals of the main elements in drawings

10: object 11: table.

12: object group 20: x-axis actuator.

22, 32: mirror 30: y-axis actuator.

40: photography mechanism 50:light source(light source)

100: handler 110: scan head.

112: zoom lens 114: telescope.

120: CCD camera 130:optical source section(light source)

132: light source generator 134: light source selection switch box.

140: CPU 150: scan controller.

160: servo driver.

a: working distance (working distance) b: the traveling direction of a camera.

c: the traveling direction of the table A, B, C, D: discrete object.

θx, θ y: the deviation according to the size of under test object.

Details of the Invention

■ Purpose of the Invention

• The Technical Field to which the Invention belongs and the Prior Art in that Field

The present invention relates to the area scan vision inspection system of the semiconductor device, particularly, to not only the lead frame which is the essentiality meterial of the process of manufacturing semiconductor but also the area scan vision inspection system in which the standard of badness more precisely can perform the inspection of the other field including the more minute wafer, LCD and TFT etc. and which can be programmed.

The general area scan vision inspection system is comprised of elementarily,primarily, the CCD camera (it has the digital type or the analog type), the light source, and CPU etc. controls the image of the object. The light source is combined in the CCD camera and provides the illumination to an object. CPU etc. controls the image of the object captures by using the CCD camera and light source.

Generally, it is limited according to the object of the check field of the viewing direction (it says to be FOV less than the FOV:Field Of View) of the range prescribed as to the inspection of the semiconductor device is the resolution of the CCD camera, the size of the required inferiority of the inspection target object, a quantity, and a form and the other inspection.

For example, presently, generally, as to case, it inspects the object which the badness element specifies regardless of the inspection target object it is the CCD camera (for example, the Japanese products of the Kodak company) having the resolution of 2,048 ×2,048 pixel of the used digital type, the result as follows is obtained. That is, it could not inspect in excess of 10㎜ ×10㎜ domain in case the size of the inferiority object was about 5㎛.

And if it is according to be known, the case of being the digital camera till now has the resolution of 2,048 ×2,048 to that. However. Therefore, as described above, FOV becomes smallerer the size of the inferiority object is about 5㎛ the analog camera is used. That is, in this case, the proper check field is limited to 5㎜ ×5㎜.

Generally, referring to figs. 1 and 2, it decides to illustrate for the test coverage of the semiconductor device using the used area scan vision inspection system.

Figure 1 is an illustrative view illustrating the test coverage by the general area scan vision system. (a) of fig. 2 shows the shape of the object group consisting of a plurality of objects. And (b) of fig. 2 is the drawing illustrating the test sequence of each object.

In fig. 1, the handler , and 120 supplying the object in which the light source , and 100 in which the reference numeral 10 the object , and 11 which is under test objects the table , and 50 raising the object (10) are combined in the CCD camera and irradiating the fixed illumination in an object transfer of the test equipment

and which is the blood test objects the CCD camera , and a which is the photographic means of an object show the working distance the object (10) and CCD camera (120) interval. A b shows the traveling direction of the CCD camera (120). And a c shows the traveling direction of the object (10).

Generally, in the used area scan vision test coverage, it has the moving camera mode, moving a camera and the transfer table (moving table) mode moving the table in which an object is placed.

More concretely, the general area scan vision test coverage decides to be illustrated with reference to (a) of figs. 1 and 2, and (b).

Firstly, the moving camera mode is the method in which the CCD camera (120) perpendicularly,plumb mounted on the check position recognizes clearly the object (10) while moving to the horizontal direction.

That is, after the CCD camera (120) takes a picture of the object (A) of the first and FOV of a camera is determined and as shown in (a) of fig. 2, as shown in (b) of fig. 2 the group of the object in which a plurality of objects is successively arranged is formed, the object (10) is inspected, it progresses as the horizontal direction and the object (B) of the second is inspected. Similarly, if an inspection is finished after determining FOV about the object (B) of the second, it moves to the object (C) of the third and the CCD camera (120) inspects through the photography. In this way, it is the mode which successively inspects the object (A, B, C, D) of the discrete included in the object group (12). At this time, provided is the illumination of having the fixed brightness to that from the light source (50) combined in the CCD camera (120) in order to raise the illuminance of an object.

Next, as to the transfer table mode, a camera is the method for attending the inspection of the whole-area manner by putting in the fixed location and moving the table (11) in which the object (10) is placed, contrary to the moving camera mode. That is, in the object group (12) as illustrated in (a) of fig. 2, after the object (A) of the first is positioned at the FOV in range of the camera predetermining and a check is performed, it is the mode moving the table (11) and progresses an inspection as the object (B), and the order of the object (C) object (D). Of course, the viewing direction (FOV) of the camera when each object moved has to be separately adjusted. Similarly, provided is the illumination of having the fixed brightness to that from the light source (50) combined in the CCD camera (120) in order to raise the illuminance of an object.

The precision of the semiconductor test system depends on upon the FOV size. When having the value in which the resolution of a camera is fixed, if FOV is small, a prosecutor is precisely comprised as that. Therefore, in order to inspect the object group (12) whole consisting of a plurality of objects at a time, as shown in Figure 1, the working distance (a) between the object (10) and the CCD camera (120) are become estranged. But if the working distance (a) is increased and it makes FOV big, the problem that the precision is decreased is generated. Moreover, it is difficult for an usage in the system which demands the level minute because of having the concern in which the precision of the translation distance is decreased because the system is mechanically made with the motor to move the CCD camera or the table.

In this case, as to 2 kinds mode described in the above, the stability of an inspection is altogether therefore the repetitive inspection decreased about the movement hardware assembly at FOV. The inspection takes the time to be many so that it scan the whole-area manner because it is sensitive to a vibration as that, that is influenced.

Moreover, there can be the problem it can use the line scan camera, and it can use the relatively cheap camera obtaining 6,000 ×1 pixel, 4,000 ×1 pixel etc. generally in case of using the line scan camera, but such line scan camera precisely has to move to very small unit of 1 pixel by pixel basis, and therefore, that the productivity is worse than while a speed can obtain the good image only when very adagio scanning as the area scan vision inspection plan.

* The Technical Challenges of the Invention

FOV which is the domain which a camera can recognize in the general area scan vision inspection system at a time as described in detail is limited. And this FOV is to the maximum 10㎜ ×10㎜ domain.

This enforces the badness test based on the lead frame which is the essentiality meterial of the process of manufacturing semiconductor. However, in case the standard of badness performs the inspection of the other field including the more minute wafer, LCD, TFT etc., such FOV is limited within the smaller range. Therefore, in order to perform the minute check, it makes FOV small and lots of the camera assemblies is assembled to the multi-array and it use.

And when it inspects by only using only one camera assembly, it gradually,by stages has the object which is the inspection target object make the movement (step by step moving) as FOV which is given in a camera and it inspects or the camera itself is gradually,by stages moved as the check field and the inspection target object which is greater than FOV of a camera is inspected. Therefore, if the general scan vision test system having such limit is made the most of, the test time gratuitously increases in the manufacturing process of in line process, the back-end processes (Back End Process), TFT, LCD etc at the assembling process at the process of manufacturing semiconductor and the productivity is very decreased.

That is, the productivity becomes per hour low and the Holotrichia cycle is lengthened. And in conclusion, the manufacturing cost grows. However, because of not discovering the method for solving such problem, such technology and then, is now used in a manufacturer.

Furthermore, the manufacturer or the general TFT of the current semiconductor device, and the manufacturers of the other semiconductor device and LCD are constantly asked for the saving of the rising request of the productivity and manufacturing cost, and the increment of the Holotrichia cycle and supply of the more quick product from final users.

Moreover, as to the Holotrichia of the semiconductor device, it is highly integrated with miniature, a frivolity, the multi-part hang up. It is in the trend formed into one lead frame, substrate, film pattern, a wafer etc. A device is designed so that the quantity integrated with per square of a device be increased. The size of the unit object is more and more enlarged.

For example, a width increases in 30㎜ to 75㎜ in case of being the SOIC lead frame. The length is in 100㎜ to 270㎜ the codfish hardening. And presently a width has in all processes in this kind of trend. And the codfish hardening of all packages of the PLCC, TSOP, QFP, TQFP, BGA, FBGA, μ BGA, TSSOP, SSOP, MLP, CSP etc drastically step ahead.

However, in case of the CCD camera in which a resolution is 1500 ×1300 pixel, FOV of the optical cameras of the conventional area scan vision test equipment have the timely limit on the badness test quick because it is a maximum to be 10㎜ ×10㎜ domain.

The present invention is to provide the area scan vision inspection system which can save the manufacturing cost the intended a thing shortens the Holotrichia cycle it precisely performs the badness test in a short time there is much object quantity it solves the overall problem like above statement canning be programmed.

■ Structure & Operation of the Invention

The area scan vision inspection system canning be programmed includes light source generator generated around the light source which includes the CCD camera, the telescope for being adhered to the CCD camera and enlarging the image of an object and observing, the zoom lens for being combined in a telescope and controlling the field of view of the CCD camera, and the scan head transferring of the test equipment and include the handler supplying the object, the optical source section providing the light source for illuminating an object, and the photography mechanism consisting of the camera for taking a picture of an object, and in which a wavelength the optical source section differs with a plurality of. It can be achieved by the area scan vision

inspection system which includes the light source selection switch box for selecting the light having the wave length which is most suitable for the object according to a shape and size of an object and outputting canning be programmed. The handler supplying the object is the blood test objects. The CCD camera is the area scan check system of the semiconductor device, and the photography mechanism is the camera for taking a picture of an object. The scan head moves a phase in order to capture the image of an object while being combined in the zoom lens and fitting the field of view with a shape and size of an object and moving according to the field of view of the CCD camera.

The above-described purpose, the characteristic of the present invention and advantage are evident than the detail description relating with the attached view.

(embodiment)

Referring to Figure 3, the test coverage by the area scan vision inspection system canning be programmed decides to be illustrated.

Figure 3 is a block diagram showing the omni configuration of the area scan vision inspection system canning be programmed.

In fig. 3, CPU , and 150 having serially connected a plurality of I/O ports built in and in which the telescope , and 120 for moving according to FOV and the handler , and 110 which exchanges the external device and signal including CPU etc. while it transfers of the test equipment and the reference numeral 100 supplies the object which is the blood test objects capturing an image and being adhered to the CCD camera and the scan head , and 112 moved to the asynchronous transfer mode the zoom lens , and 114 for controlling FOV in which a deviation is generated according to the size of an object enlarging the image of an object and observing the CCD camera , and 130 for taking a picture of an image the optical source section , and 140 providing the secondary optic for clearly determining an object connect the control device including the handler (100), the optical source section (130), the CCD camera (120) and scan controller etc. and controlled the scan controller , and 160 controlling the scan head (110) show the servo drive operating the scan head (110). Here, the peculiar photography mechanism (40) of the present invention is formed into the scan head (110), the zoom lens (112), the telescope (114) and CCD camera (120).

As shown in Figure 3, the area scan vision inspection system canning be programmed puts the object (10) for to measuring on the handler (100) and it performs a check.

If the object (10) which is under test objects raises on the handler (100).

Next, in order to clearly distinguish object (10), the optical source section (130) is controlled. At this time, in the optical source section (130), a plurality of light source generators (132) for generating the respective other wavelength is equipped. According to the shape or the size of the object (10), the light source generator (132) generates the light having the wave length for most clearly taking a picture of the object object. For example, in order to case the time and the thickness in which an object has the relative dark color thick, it makes this bright and it does the precision is high the red light of the bright color system is generated. The photography of the object in which it generates the blue light in case the thickness is thin and the precision is always high and the time having the lust in which relatively an object is bright is possible. At this time, as to the light generated from

the light source generator (132), the red (R), the green (G), and the colour of the blue (B) system are possible. However, these colours can be combined to the light having the color which is appropriate according to the shape of the object or the size and state.

And in the optical source section (130), the light generated from the light source generator (132) is selected and the light source selection switch box (134) for providing to the telescope (114) inside is additionally equipped. In the light source selection switch box (134), the suitable light source is selected according to the shape of the object (10) or the size and state.

The light source which is drawn through the light source selection switch box (134) is irradiated inside the telescope (114) combined through the light guide in the zoom lens (112). It supplies the light to FOV of the object (10). It enlarges the FOV and it precisely controls. At this time, the optical source section (130) receives the analog signal of the predetermined (approximately, 0~ 5V) from the I/O port which is built in the CPU (140) and it appropriately can control an illuminance according to the object object (10).

In this way, if FOV according to the size of the image of the object (10) is determined, the object (10) is taken a picture of by using a camera including the CCD camera (120) etc. The apparatus and the dissimilar signal are exchanged through the I/O port which is serial, is image data of the photographed object (10) as described above connected to the CPU (140) and has.

The scan controller (150) controls an actuator including the galvano meter etc. is built in the scan head (110) the scan controller (150) receives data about the domain scanned from the host computer (illustration omission) through the serial port with offer.

At this time, the control input detected through the scan controller (150) materially runs the scan head (110) the control input detected through the scan controller (150) is provided to the parallely connected servo drive (160).

That is, scan data inputted through the serial port (142) which is built in the above CPU (140) consist of the scan controller (150) with uploading. In order to enough recognize clearly the region of interest of the object (10) the galvano meter (figures are omitted) that is the actuator which is built in the scan head (110) is controlled. The scan head (110) is run through the servo drive (160) according to the control input.

Here, the range can recognize is changed according to the actuator which is built in the scan head (110). While rotating to the maximum ± 20° in case of using the galvano meter in which the precision is high as an actuator, the object (10) can be scanned. But while maintaining the linearity of the scan area, the angular range that the distortion penuriously can scan the object (10) can scan to about approximately, ± 10° so that an error be minute in this in range.

That is, in case FOV is about ± 10°, the minute measurement is possible from the maximum 2.3㎛ ×2.3㎛ to the range of 330㎜ ×330㎜ domain. This thing is conspicuously improved in comparision with 10㎜ ×10㎜ which is the maximum FOV at the general area scan vision inspection system.

Therefore, according to the area scan vision inspection system canning be programmed, the precision is high as the fast processing, lots of the objects is inspected at a time.

Next, referring to Figure 4, it more circumstantially decides to illustrate for the area scan vision inspection system canning be programmed.

Figure 4 is a conceptual diagram of the area scan vision inspection system in which the high speed scanning is possible.

In fig. 4, the X-axis actuator , and 30 show the Y-axis actuator the reference numeral 20. 22, 32 is the mirror used to each X/6, and the Y-axis actuator. And θ x/6, and θ y/6 show the deviation according to the size of

under test object.

As shown in Figure 4, x-axis actuator (20) and Y-axis actuator (30) having each mirrors (22, 32) are controlled. In that way the image spanned the wide domain is precisely read to the high definition.

That is, if an image of the object of any size is inputted with the CCD camera (figures are omitted) etc. At this time, the information of the inputted object (10) is the information which is two dimension provided from X, and Y axial.

Generally, it is preferable that the AC motor in the kind of the actuator, controlling the operation of a mirror the DC motor, the step motor and galvano meter etc do not have a relation even if it has and it uses ***. But it uses the galvano meter that precisely can measure data than the side requiring a high-accuracy and the high productivity.

In order to obtain an image in order to have the resolution of 5㎛ to that by using actually general light digital cameras (2,048 ×2,048), in FOV, 1㎝ ×1㎝ has to be. But the camera itself is high prices (about 3.6 times of 1,024 ×1,024 product). It is nonefficient in the efficiency aspect or the cost side to scan this small domain while the camera or the table moves.

With respect to this, as to the area scan vision inspection system canning be programmed, the range is comprised so that the range of FOV have the ultrafine resolution less than 2.3㎛ about the maximum 300㎜ ×300㎜ domain.

It decides to illustrate for the precisely measurable area scan vision inspection system of the present invention with reference to below drawing 5.

(a) of fig. 5 is the illustrative view illustrating the test coverage by the area scan vision system. (b) of fig. 5 is the object group (12) at (a) of fig. 5 the magnificated drawing.

In as shown in (a) of fig. 5, and (b), the area scan vision system, it is installed at the location in which the object group (12) and scan head (110) are altogether fixed and a check is performed. That is, the CCD camera (the Figures are omitted) is used about the object group (12) covering the range (Θ) according to desired FOV, the image of the object reflected through the lens (112) inside the scan head (110) is magnified. In that way at the same time, the object group (12) whole is taken a picture of.

At this time, as shown in (b) of fig. 5, the area scan vision system subdivides FOV and it divides into the different domain and it precisely takes a picture of the image of the discrete object (A, B, C, D).

In this way, it is combined through the process of programming at the host computer (figures are omitted) and it forms according to the original image and the image which is classified into the different piece and is photographed inspects. Moreover, the precision that much levels up because FOV is minute.

And it is made with a scanner on the movement of FOV like a convention without the task moving a camera or an object. A control the translation distance of FOV is possible to the range that is minute to the minimum 2.3㎛. And a control the FOV move time is possible to the minimum 2.3㎛.

Moreover, in order to more precisely control FOV according to the size of an object as described in detail, the zoom lens (112) is adhered to the scan head (110). By adhering to the zoom lens (112) it minutes, FOV is controlled and a check is performed about the domain in which the precision is high required. FOV is enlarged for the so domain and a check is performed. At this time, the light source can be controlled according to the content of an object in order to improve the sharpness of an object.

■ Effects of the Invention

In this way, according to the area scan vision inspection system canning be programmed, even in case there is much quantity of under test semiconductor object, the badness test is precisely performed in a short time and the Holotrichia cycle is shortened. And the manufacturing cost is saved.

The above-described preferred embodiments of the present invention is disclosed for the object of example. And and an addition will be possible through the thought of the present invention and the range disclosed in the range of the patent claim which is attached if it is the person skilled in the art in the world.

Scope of Claims

Claim 1 :

The area scan vision inspection system canning be programmed of the area scan check system of the semiconductor device transferring of the test equipment and includes the handler supplying the object, the optical source section providing the light source for illuminating an object, and the photography mechanism consisting of the camera for taking a picture of an object, wherein: the photography mechanism are comprised of the light source selection switch box it includes the CCD camera, the telescope for being adhered to the CCD camera and enlarging the image of an object and observing, the zoom lens for being combined in a telescope and controlling the field of view of the CCD camera, and the scan head; the optical source section includes the light source generator in which a wavelength is generated the different light source with a plurality of; and for selecting the light having the wave length which is most suitable for the object according to a shape and size of an object and outputing; the CCD camera is the camera for taking a picture of an object; and the scan head moves a phase in order to capture the image of an object while being combined in the zoom lens and fitting the field of view with a shape and size of an object and moving according to the field of view of the CCD camera.

Claim 2 :

The area scan vision inspection system which additionally includes CPU for controlling photographed data about an image it is connected to the photography mechanism and optical source section as to claim 1 canning be programmed.

Claim 3 :

The area scan vision inspection system which additionally includes the servo drive canning be programmed of claim 2, wherein the photography mechanism operates the scan head with the scan controller, for controlling the scan head with the above CPU and scan controller.

Claim 4 :

The area scan vision inspection system canning be programmed of claim 1 or 2, wherein the optical source section is the structure of supplying the generated light source as described above through the light guide within a telescope.

Drawings

Fig. 1

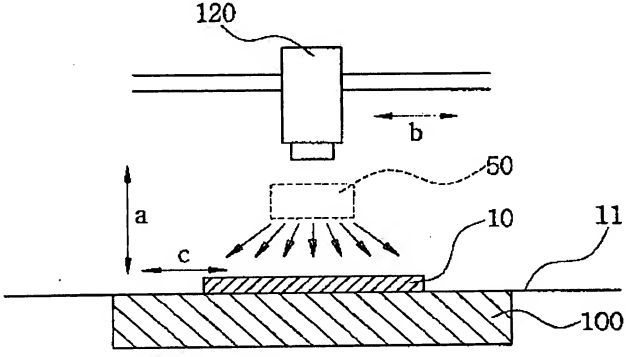


Fig. 2

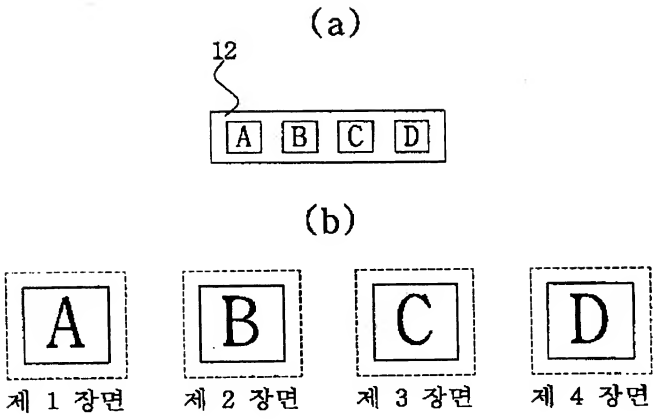


Fig. 3

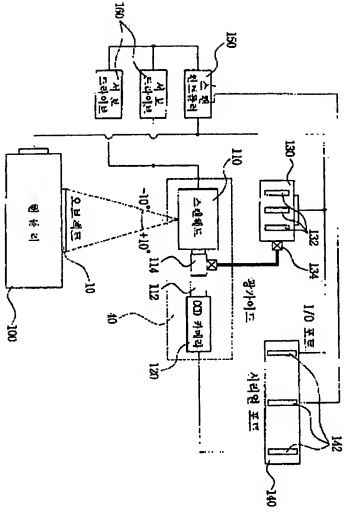


Fig. 4

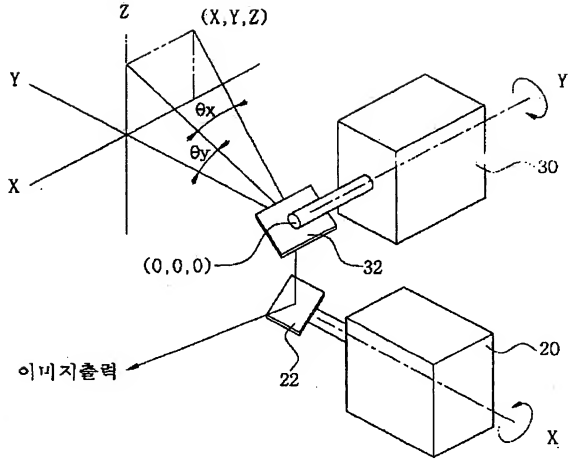
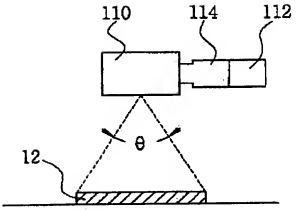
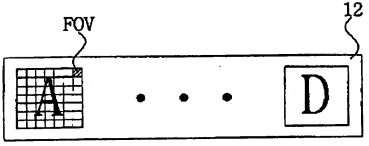


Fig. 5

(a)



(b)



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